Notice of Allowability	Application No.	Applicant(s)	
	10/538,703	LICATA, RENATO	
	Examiner	Art Unit	
	Galen L. Barefoot	3644	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *1/30/2006*.

2. ☒ The allowed claim(s) is/are *1-3*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☒ All b) ☐ Some* c) ☐ None of the:
      1. ☒ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ ~~Information Disclosure Statements~~ Search Report (PTO/SB/08), Paper No./Mail Date 6/10/2005
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

EXAMINER'S AMENDMENT

The drawings have been approved.

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows:

Claims 1-3 have been amended to include status identifiers.

1. (Amended) A deployment mechanism for expendable space tether applications comprising essentially a fixed single-layer tether winding cylinder (6), a multiple-layer tether winding central spool (8), an initial separation impulse mechanism (10) for passive tether deployment, and a tether deployment brake (12) of daisy-like shape; characterized in that

said mechanism accommodates a first portion of tether (7), many kilometers in length, wound up on said inner multi-layer spool (8), followed by a second portion of said tether (7), many hundred meters in length, wound up in a single layer on said outer cylinder (6), ~~In~~ in order to allow the passage of the tether (7) both on ground, during the required tether winding and preparatory operations, and on-orbit, during the actual deployment by the unwinding of its two types of tether windings, a surface cut (9) of said outer cylinder (6) of sufficient width and along most of its length is provided, ~~In~~ in this way once the continuous space tether is deployed on orbit, the unwinding tether will pass through said cylinder cut (9) and will continue to unwind

from said multi-layer central spool (8) till the end of deployment; said initial separation impulse mechanism for passive tether deployment comprises a central sinusoidal spring (10), mounted inside the core of said fixed multi-layer tether spool (8) and capable of storing the required energy for initial separation of the tethered masses; said separation spring (10) is kept in a compressed state, during ground operations and ground and space transportation and before on-orbit separation and deployment, by some, usually three, pyro-bolts (3) mounted on the mechanism cover (1) and its interface plane with the external surface (2) of the carrier spacecraft; at separation time, on command coming from ground through the carrier spacecraft telemetry and telecommand on-board system, said pyro-bolts (3) are actuated, said central spring (10) is released and the whole deployment mechanism, with its cover (1), spring (10) and full tether windings, will separate about the orbit local vertical direction from said carder spacecraft (2);

and said passive tether deployment brake (12) of daisy-like shape and flexible material, incorporated within said centrally fixed multi-layer spool tether winding (8) and fixed on the spool central core mounting, will deploy On-orbit during tether deployment operation at the planned length of the deployed tether or distance of the tethered end-masses; the deployment of this device increases by the planned magnitude or amount the tether deployment friction resistance force, so that the decreasing of the tether deployment rate from the deployer mechanism is gradually provided and applied until the end of the deployment operation.

2. (Previously presented) The deployment mechanism claimed in claim 1, further comprising a tether mechanism interface plane (13), to be bolted onto said external surface (2) of the carrier spacecraft, an external protective cover (1) bolted by said pyro-bolts (3) to said

interface plane (2) with the carder spacecraft, .mountings Of the carrier-end tether attachment (16), electronic boxes (17), data and power interface connectors (5), and an outer tether winding V-shaped gripping or restraining device (18); characterized in that said tether mechanism interface plane (13) is bolted to an external surface (2) of said carder spacecraft by substantially three simple bolts (19) and remains mounted onto the external surface of the carder, .with electronics and other components of the deployment device, after on-orbit initial separation Of the deployer mechanism and deployment operations of the tether and the. tethered end-masses; in that said external protective cover (1) bounded by said pyro-bolts (3) to the interface plane (13) with said carder spacecraft is b01tedas a single structure to said tether winding spool (8) structures with said spring separation device (10) incorporated; said cover (1) is also used as a protective shell, for the tether windings and all the other deployer mechanism components, mainly against potential micro-meteorite impacts .and the material aging effects due to ultra-violet ray exposure or to exposure to other types of dangerous space radiation;

said mountings of the attachment point of the tether end at the carder spacecraft side, said electronics boxes (17) and said data and power interface connectors (5) of the tether application system, such as for the electro-dynamic tether propulsion application, and said V-shaped outer tether winding restraining or gripping device (18) are all mounted to be fixed and to remain on the mechanism interface plane, on the exterior of the carrier spacecraft until the end of the space tether application; the carrier spacecraft bound electronics components for the electro-dynamic tether application are represented by a hollow cathode (14), relays and current measurement and control electronics (15); and said V-shaped tether winding gripping device (18) is of elastic (beam) type and its mounting on the interface plane is in correspondence of said outer tether

winding cylinder (6) end-border, so that the first few single layer tether winding spirals are gripped to the cylinder surface and the tether winding tension kept until on-orbit deployment separation action for which these tether winding spirals and cylinder are freed from said V-shaped restraining device (18).

3. (Previously presented) A passive method for tether unwinding, based on the mechanism claimed in claim 1, characterized in that said tether unwinding comprises the following steps: an impulse applied for separation from said spacecraft (2) performed by said spring (10); tether unwinding from said single-layer cylindrical outer spool (6), involving a first tether length of many hundred meters with tether deployment resistance or friction force of value nearly equal to zero; further tether unwinding from said multi-layer spool (8), located inside said outer single- layer spool (6) of the remaining portion of the many kilometers long tether; and tether deployment braking action resulting from a constant friction force applied by means of said brake (12), through which said tether (7) is made to pass.

The following is an examiner's statement of reasons for allowance: none of the prior art shows the detail of the deployment mechanism including the spool arrangement, separation means and brake as claimed.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Galen L Barefoot whose telephone number is 571-272-6898.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Teri Luu can be reached on 571-272-7045.

On July 15, 2005, the Central FAX Number will change to **571-273-8300**.

CENTRALIZED DELIVERY POLICY: For patent related correspondence, hand carry deliveries must be made to the Customer Service Window (now located at the Randolph Building, 401 Dulany Street, Alexandria, VA 22314), and facsimile transmissions must be sent to the Central FAX number, unless an exception applies. For example, if the examiner has rejected claims in a regular U.S. patent application, and the reply to the examiner's Office action is desired to be transmitted by facsimile rather than mailed, the reply must be sent to the Central FAX Number.

Any inquiry of a general nature or relating to the status of this application or proceedings should be directed to **800-786-9199**.

Information regarding the status of an application may also be obtained from the Patent Application information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

September 18, 2006

Galen Barefoot
Primary Examiner
Technology Center 3644

6/01/2005

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IT2004/000638

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B64G1/64 B64G1/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B64G B65H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ, COMPENDEX, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CARROLL J A: "SEDS Deployer Design and Flight Performance" AIAA PAPER, 'Online! no. 93-4764, 1993, XP002322656 Retrieved from the Internet: URL:http://www.tetherapplications.com/papers/aiaa93-4764.pdf> 'retrieved on 2005-02-18! cited in the application page 2, column 1, paragraph 1 - column 2, paragraph 2; figure 2	1,3
A	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 08, 6 October 2000 (2000-10-06) & JP 2000 128097 A (MITSUBISHI HEAVY IND LTD), 9 May 2000 (2000-05-09) abstract	1,3

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 March 2005	13/04/2005

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Calvo De No, R

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/IT2004/000638

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	RAITT D, VAN DER HEIDE E J, KRUIJFF M, HERMANNS F: "IAC-03-U.2.b.09: Space Spin-in from Textiles: Opportunities for Tethers and Innovative Technologies" 54TH INTERNATIONAL ASTRONAUTICAL CONGRESS, 'Online! 29 September 2003 (2003-09-29), XP002322657 BREMEN, DE Retrieved from the Internet: URL:http://www.delta-utec.com/iaf/IAC-03-U 2.b.09-Textile-Spin-In-Heide.pdf> 'retrieved on 2005-02-18! page 2, column 2, paragraph 2 - page 3, column 1, paragraph 1; figure 1	1,3
A	PATENT ABSTRACTS OF JAPAN vol. 016, no. 452 (M-1313), 21 September 1992 (1992-09-21) & JP 04 159199 A (SUSUMU SASAKI; others: 01), 2 June 1992 (1992-06-02) abstract	1,3
A	US 4 083 520 A (RUPP ET AL) 11 April 1978 (1978-04-11) the whole document	1,3
A	LICATA R: "Tethered system deployment controls by feedback fuzzy logic" ACTA ASTRONAUTICA, vol. 40, no. 9, May 1997 (1997-05), pages 619-634, XP002322658 page 619, column 2, paragraph 3 - page 620, column 2; figure 2	1,3
A	SABATH D, KAST W, KOWALCZYK M, KRISCHKE M, KRUIJFF M, VAN DER HEIDE E: "Results of the parabolic flight tests of the RAPUNZEL deployer" ACTA ASTRONAUTICA, vol. 41, no. 12, December 1997 (1997-12), pages 841-845, XP002322659 page 842, column 1, last paragraph - column 2, last paragraph; figure 2	1,3
A	GATES S S ET AL: "ADVANCED TETHER EXPERIMENT DEPLOYMENT FAILURE" JOURNAL OF SPACECRAFT AND ROCKETS, AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS. NEW YORK, US, vol. 38, no. 1, January 2001 (2001-01), pages 60-68, XP001025007 ISSN: 0022-4650 page 60, column 2, last paragraph - page 62, column 1, last paragraph figure 3	1,3

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/IT2004/000638

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	NAKAMURA Y, SAKAMOTO Y, HIRAYAMA H, YASAKA T: "ISTS 2000-d-09: Study on a Tether Deployment System (TDS) of a Micro Tethered Satellite" 22ND INTERNATIONAL SYMPOSIUM ON SPACE TECHNOLOGY AND SCIENCE, 'Online! 28 May 2000 (2000-05-28), - 4 June 2000 (2000-06-04) XP002322660 TOKYO, JP Retrieved from the Internet: URL:http://ssdl-www.aero.kyushu-u.ac.jp/quest/quest-1/papers/00ists_d-09.pdf> 'retrieved on 2005-02-18! page 2	1,3
A	GWALTNEY D A, GREENE M: "Design of a Reel Mechanism for Control of an Orbiting Single Tether System" 22ND SOUTHEASTERN SYMPOSIUM ON SYSTEM THEORY, 11 March 1990 (1990-03-11), - 13 March 1990 (1990-03-13) pages 363-367, XP002322661 COOKEVILLE, TN, USA page 364, column 1, paragraph 3 - column 2, paragraph 2; figure 3	1,3

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IT2004/000638

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JP 2000128097	A	09-05-2000	NONE	
JP 04159199	A	02-06-1992	NONE	
US 4083520	A	11-04-1978	NONE	